

TITLE

Linking the Utah Birth Defect Network Registry to the Environment

THEME

Foster Collaborations Among Health and the Environment

KEYWORDS

child health, birth defects, Geographic Information Systems, environmental pollution sources, spatial analysis

BACKGROUND

Birth defects are a leading cause of infant mortality. The annual health cost of treating children with birth defects is estimated to be over eight billion dollars. Many explanatory factors have been demonstrated including heritable risk, prenatal and nutrition deficiencies, infectious diseases, and exposure to environmental toxic substances. The Utah Birth Defect Network (UBDN) was established in 1994 to assess the impact of congenital malformations in Utah; to determine factors involved in etiology; and to develop insights into primary prevention strategies.

OBJECTIVE(S)

To support the UBDN, the Utah Environmental Public Health Tracking Program (UEPHTP) initiated a project to 1) geographically link the UBDN registry to environmental pollution sources using geographic information system tools and 2) to develop tools to analyze the spatial distribution of birth defect prevalence in Utah.

METHOD(S)

All cases of birth defects (5,253 records) registered with the UBDN from 1994 through 2002 were geocoded using commercially available address-matching data. Surveillance for all major types of birth defects was implemented in 1999 and this subset of data (3,993 records) was analyzed for spatial structure. The data for children aged 0–4 years were obtained from the 2000 census. In the future, geocoded locations of all births from Utah vital records data will be used. The locations of environmental pollution sources (14 NPL sites, 382 CERCLIS sites and 164 TRI sites) in Utah were obtained from the Utah Automated Geographic Center. The five-year (1999–2002) area prevalence rate-ratio was calculated using the state rate as the comparison value. At the census tract level, spatial autocorrelation of prevalence rates within a county was determined using Moran's I and Getis-Ord G statistics. Populations within census tract units containing at least one of the environmental pollution sources were considered exposed. A real association with environmental pollution sources was determined by odds ratio.

RESULT(S)

Most of the UBDN registry (5,131; 97.7%) were matched to street address using a combination of automatic and manual matching methods. Ninety (1.7%) records did not have a street address and were located to either a community or zip code centroid. The remaining 32 (0.6%) records did not have sufficient information to geocode. The overall success for geocoding the UBDN registry was 99.4%. Spatial analysis of 5-year (1999–2002) county prevalence rates identified only

Salt Lake County (Utah's most populated county) with a significantly increased rate. Spatial analysis of the 5-year prevalence rates for Salt Lake County census tracts did not identify a pattern of excess rates. Census tracts with at least one environmental pollution source were not found to be significantly associated (OR = 1.08; 95% CL = 0.97 - 1.20) to the spatial distribution of birth defect prevalence.

DISCUSSION/RECOMMENDATION(S)

This project developed a spatial linkage between birth defects registry data, the Utah population, and environmental pollution sources. Additional work is being done to link Utah birth data. Several tools were developed to assist in creating this linkage. Spatially-linked health, population and hazards data provides a way of associating hazards risks and adverse health outcomes. Successfully establishing an accurate linkage requires the researcher to have a good understanding of the spatial domain.

Analysis of the spatial structure of the prevalence of birth defects for 1999 to 2002 did not result in any remarkable finding. The methods used have been shown to be sensitive to over-dispersion and outliers, and insensitive to neighboring areas. Other methods (e.g., Bayesian methods) are available. Environmental epidemiologists need to be familiar with these methods.

AUTHOR(S)

Sam LeFevre, M.S., D.Sc.
Epidemiologist, Environmental Epidemiology Program
Utah Department of Health
P. O. Box 142104
Salt Lake City, Utah 84114-2104
801-538-6191
slefevre@utah.gov

R. Wayne Ball, M.P.H., Ph.D., D.A.B.T.
Environmental Epidemiology Program, Utah Department of Health
wball@utah.gov

Gambrelli Layco, M.F.S.
Environmental Epidemiology Program, Utah Department of Health
glayco@utah.gov

Marcia Feldkamp, P.A., M.S.P.H.
The Utah Birth Defect Network, Utah Department of Health
mfeldkamp@utah.gov

Lynne MacLeod, M.Stat.
The Utah Birth Defect Network, Utah Department of Health
lmacleod@utah.gov

Miland Palmer
The Utah Birth Defect Network, Utah Department of Health
mpalmer@utah.gov

